



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
|-----------------|-------------|----------------------|---------------------|------------------|

10/551,316

06/09/2006

Patrick Barry Hook

16806.2

6529

21999

7590

07/20/2009

KIRTON AND MCCONKIE  
60 EAST SOUTH TEMPLE,  
SUITE 1800  
SALT LAKE CITY, UT 84111

EXAMINER

NELSON, MICHAEL B

ART UNIT

PAPER NUMBER

1794

MAIL DATE

DELIVERY MODE

07/20/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

|                              |                                      |                                    |  |
|------------------------------|--------------------------------------|------------------------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>10/551,316 | <b>Applicant(s)</b><br>HOOK ET AL. |  |
|                              | <b>Examiner</b><br>MICHAEL B. NELSON | <b>Art Unit</b><br>1794            |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 18 May 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 May 2009 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

Art Unit: 1794

## **DETAILED ACTION**

### ***Response to Amendment***

1. Applicant's amendments filed on 05/18/09 have been entered. The submitted drawings overcome the previous objections, which are withdrawn. Claims 1-8 are currently under examination on the merits. Claims 9-24 are cancelled.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

Art Unit: 1794

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shepherd et al. (U.S. 4,155,394).

6. Regarding claim 1, Shepherd et al. discloses a composite component of two engaging helical yarns of different materials (See Abstract, Fig. 1A-1C). The components are disclosed as having different elastic modulus (C1, L60-C2, L15). Shepherd et al. does not explicitly disclose that the resulting composite material have a negative effective Poisson's ratio or be auxetic; however, given that the two materials are helically arranged yarns (Fig. 1A-1C) with different moduli, when tension is applied to the composite, the higher moduli aramid yarn will straighten (C4, L35-55) and thereby cause the second component to adopt a larger diameter helical pattern since the aramid yarn will become the core axis of the composite and the second lower modulus yarn will have to form its helix around that core component (i.e. via the same mechanism as shown in instant Fig. 3). Hence the structure of Shepherd et al. would exhibit "negative effective Poisson's ratio" characteristics to at least some degree.

Regarding claims 2-8, Shepherd et al. discloses all of the limitations as set forth above. Additionally, Shepherd et al. discloses that the two materials have different moduli, (C1, L60-C2, L15). As explained in the rejection of claim 1, the arrangement of the yarns in Shepherd et al., (Fig. 1A-1C) with different elastic moduli yarns, would result in the higher moduli, "first component," loosing its helical nature and becoming straight when stretched. Consequently the lower moduli material would have its helix redefined around the now straight first component yarn. The yarns are fibers and, when stretched, the first component, high-modulus yarn provides

Art Unit: 1794

a core axis component for the second component. Stretching of the first component would increase the diameter of the second component helix and relaxing the component would cause the second component helix to reduce in diameter.

***Response to Arguments***

7. Applicant's arguments filed on 05/18/09 have been considered but are not persuasive.

8. Regarding applicant's argument that the cord of Shepherd et al. is not auxetic, the examiner disagrees. As explained in the rejection, the cord of Shepherd et al. has sufficiently similar structure to applicant's composite structure and is made of materials having properties which are similar to applicant's properties to lead one to believe that, when stretched, the cord of the prior art would have the "inextensible aramid yarn (2)...straighten out" (C4, L45-55) in the same way that the component 22 of Figs. 2 and 3 of the instant specification straighten out. Since the polyester cord (3) of Shepherd et al. is initially helically wrapped around the aramid yarn, it will have to accommodate the new orientation of the yarn and thereby form a cord with an overall larger helical diameter (i.e. in the same way as the composite of Fig. 2 and 3).

9. Applicant argues that the aramid yarn is twisted itself and therefore would stretch and extend however the aramid yarn is disclosed as being "inextensible" and therefore would not stretch or extend (C4, L45-55).

10. Applicant also argues that the polyester yarn extends before the force is taken up by the aramid yarn; however, this does not preclude the composite from exhibiting auxetic properties starting from the point at which the aramid yarn takes on the load.

11. Furthermore, any stretching of the polyester yarn is not necessarily sufficient to cancel out the increase in the overall diameter of the helix structure after the aramid yarn is

Art Unit: 1794

straightened. This line of argument also applies to applicant's contention that because the two materials of the yarn of Shepherd et al. exhibit positive Poisson's ratio then their composite must also exhibit a positive Poisson's ration. The instant mechanism for auxetic properties and the mechanism of the prior art are based on the straightening of one cord to cause the other cord to form a new helical arrangement with a diameter that is larger than the original arrangement (instant specification, Fig. 2 and 3). Therefore, even if each individual cord contracts, this does not preclude the overall helix composite from expanding due to the straightening of the higher modulus cord.

12. Regarding applicant's arguments related to the Fig. 1A-1C of the prior art, one cannot infer changes in diameter (or other dimensional attributes) from the drawings of a reference. Moreover, even if the cord of Shepherd et al. does in fact reduce its diameter in the initial phase of the application of a load, this does not preclude the composite from increasing in diameter at any point later on in the load bearing process (i.e. when the aramid cord is finally straightened out).

13. Absent any objective evidence showing that the cord of Shepherd et al. does not ever increase in overall diameter upon the application of a load, the materials used are sufficiently similar (in terms of relative modulus) and are arranged in a sufficiently similar manner (i.e. helix) to lead one having ordinary skill to conclude that, at some point, the diameter of the helix expands after a load is applied (negative Poissons's ratio).

### ***Conclusion***

14. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

Art Unit: 1794

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL B. NELSON whose telephone number is (571) 270-3877. The examiner can normally be reached on Monday through Thursday 6AM-4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Sample can be reached on (571) 272-1376. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

Art Unit: 1794

For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David R. Sample/  
Supervisory Patent Examiner, Art Unit 1794

/MN/  
07/10/09